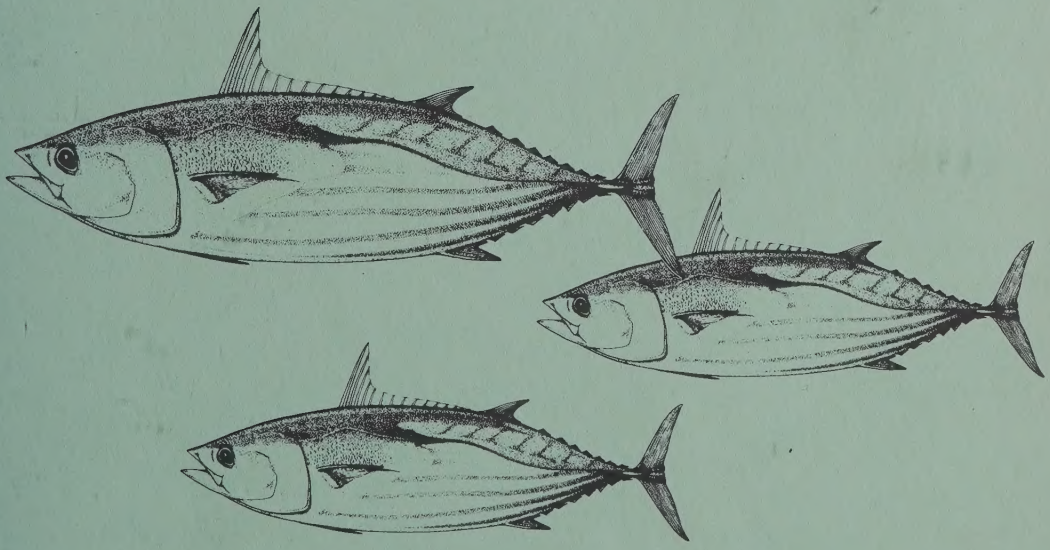
DECEMBER 1977
No. 12

FISHING INFORMATION

Southwest Fisheries Center-La Jolla, California



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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE - P. O. BOX 271
LA JOLLA, CALIFORNIA 92037

FISHING INFORMATION

DECEMBER 1977, No.12

EDITOR: JAMES A. RENNER

I. Barrett, Director, SOUTHWEST FISHERIES CENTER
R. Lasker, Acting Deputy Director
R. Shomura, Director, Honolulu Laboratory
N. Abramson, Director, Tiburon Laboratory
G. Seckel, Chief, Pacific Environmental Group, Monterey

PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) charts of winds and pressures for the eastern North Pacific, 4) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 5) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. It contains a chart of sea surface temperature (contoured at 2°F (1°C) intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department.

Submitted for publication - January 24, 1978

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ENVIRONMENTAL CHARTS ANALYZED BY:

F. Miller (Figures 8 and 9)
J. Renner (Figures 1, 2, 3, 4, 5, 6, 7, and 15 day Supplement)

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R. Allen, H. Orr

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National Ocean Survey, Pacific Marine Center, Seattle, Washington

Fisheries Research Board of Canada, Pacific Environment Institute, West Vancouver, British Columbia by L.F. Giovando from observations by:
J. Redhead at Langara Island Light; C.T. Hilliar at Cape St. James Light;
L. Collins at Kains Island Light; E.M. Chapman and M.V. Stewart at Amphitrite Point Light

Scripps Institution of Oceanography, La Jolla, California

Expendable bathythermograph and salinity observations are made by the mates and engineers of the *Californian* of the Matson Navigation Co. The data are processed under supervision of D.R. McLain at the NMFS Pacific Environmental Group, Monterey, California, using computer facilities of the Fleet Numerical Weather Central, Monterey. The project is partially supported by the National Science Foundation and the Office of Naval Research.

Sea Surface Temperature and Environmental Conditions

Forrest R. Miller

Eastern North Pacific

Sea surface temperatures (SST) normally show seasonal cooling in December. The greatest cooling normally occurs between the Aleutian low and the eastern Pacific high pressure centers (17-year mean positions, Figure 1). The north Pacific Ocean front usually lies between 35°N and 45°N and south of the region of maximum SST cooling. Weather systems frequently develop along the southern boundary of the ocean front and intensify as they move eastward along the periphery of the Aleutian low.

During December 1977, the Aleutian low pressure center was noticeably weaker than normal and was centered near 50°N, 140°W (Figure 2). The subtropical high pressure center was displaced southeast of its normal position with central pressures about 3 millibars below normal. Surface pressures were 6 to 8 millibars below normal in the eastern Pacific from 30°N to 40°N between 130°W and 150°W and surface winds south of 45°N and east of 140°W were predominately southerly. This unusual condition for December was associated with frequent development of storm centers in the central Pacific that moved eastward to the U.S. west coast at latitudes south of 40°N. As a result, southerly winds brought considerable amounts of moisture and heavy rain clouds from the tropics into the entire U.S. west coast, especially during the last half of December.

The SST pattern (Figure 3) showed a slight northward bulging of isotherms between 130°W and 140°W where southerly surface winds apparently transported warmer water to mid-latitudes. There was a significant increase in the size of the area east of 150°W covered by positive departures from normal (Figure 5). Much of the area from 25°N to 35°N between 125°W and 150°W experienced warmer SST's in December 1977 than in December 1976. The southern storm paths across the eastern Pacific during the last half of December contributed to the increase of SST's off the U.S. west coast at a time when seasonal cooling normally takes place.

Over most of the Pacific north of 40°N east of 150°W and north of 25°N west of 150°W, SST's were below normal (Figure 5). This condition was associated with high winds and rough seas along the storm paths that moved into the U.S. northwest and Canada during the first half of December, and later changed to trajectories crossing central and southern California during the last half of December. Because very few weather fronts penetrated the strong high pressure ridge over the U.S. northwest in December 1976, SST's during that month were 1 to 2°C warmer than in December 1977 (Figure 7). The eastern part of the Gulf of Alaska had markedly colder SST's than normal in December 1977, and colder than December 1976. Along the west coast of Baja California, SST departures 1 to 2°C greater than normal developed rapidly because seasonal cooling and the colder California current were inhibited by unusually light winds and seas. The eastern Pacific subtropical high pressure center was very weak most of the month and located near 30°N, 127°W which was about 400 miles southeast of its normal position (see Figures 1 and 2). Much of the abnormal weather pattern in December 1977 developed in the latter half of the month and no apparent shift back to normal conditions took place during the first half of January 1978.

Western North Pacific

During December 1977 most of Japan and the Pacific Ocean west of 145°E was under the influence of the western Pacific and east Asia high pressure systems. A low pressure center near 50°N 165°E was weaker than normal for December. Consequently, northerly winds and ocean mixing along the east coast of Japan were weaker than normal. This condition may have caused a decrease in

southward transport of colder water from north of 45°N. The north Pacific Ocean front was strongest from 37°N to 43°N between Japan and 155°W (Figure 4). The large area of positive SST departures greater than 1°C in Figure 6 indicated that the Japanese (Kuroshio) Current may have moved farther north than normal along Japan before turning eastward.

East of 170°E from 30°N to 40°N, storms developed frequently along the southern edge of the western Pacific low pressure system. These storms developed at a lower latitude than normal during November and December. The high winds, rough seas and heavy cloud cover associated with the storms caused SST's to be more than 1°C below normal over a large mid-latitude area east of 170°E and over a large part of the western Pacific south of 30°N (Figure 6).

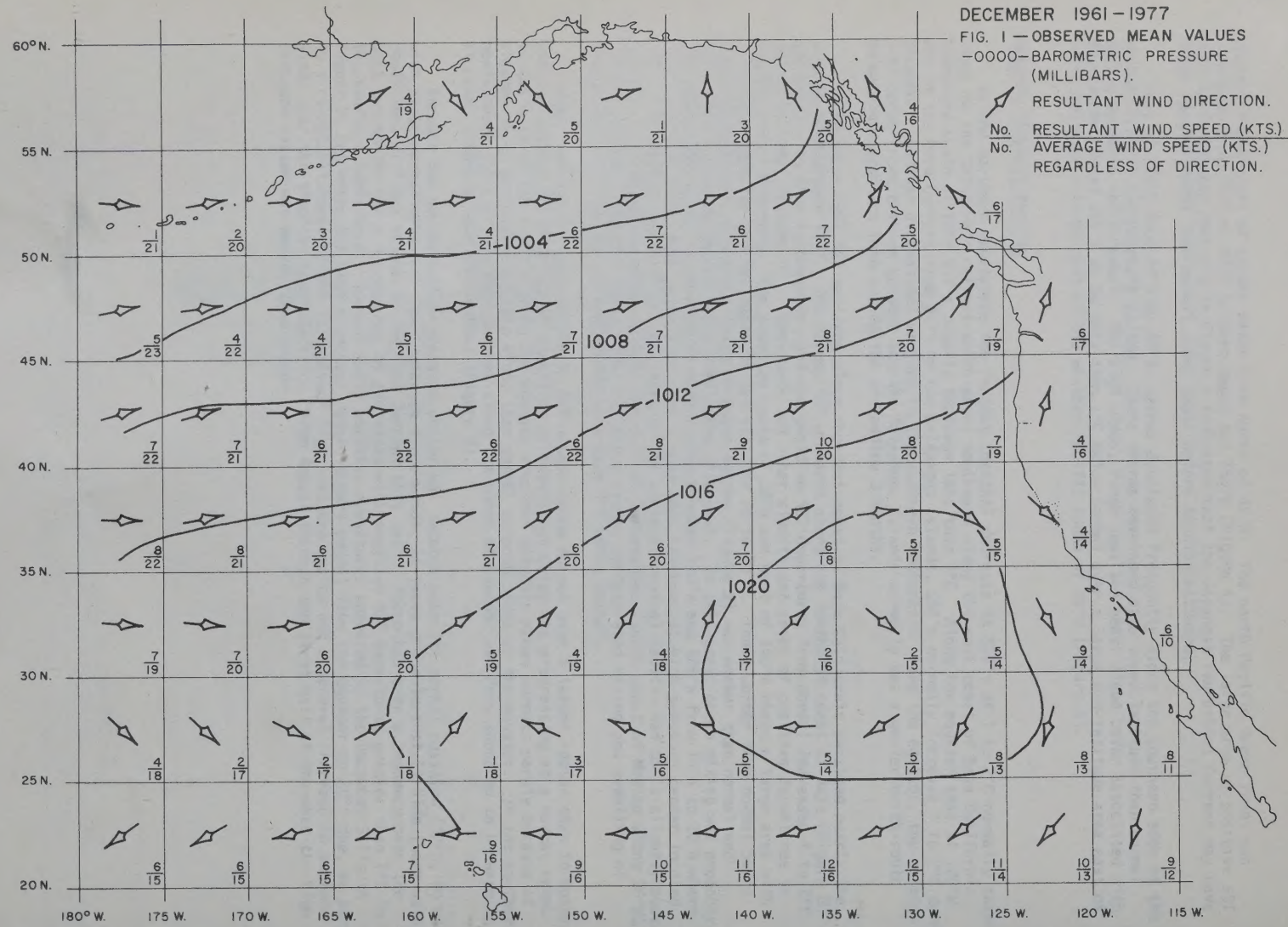
Eastern Tropical Pacific

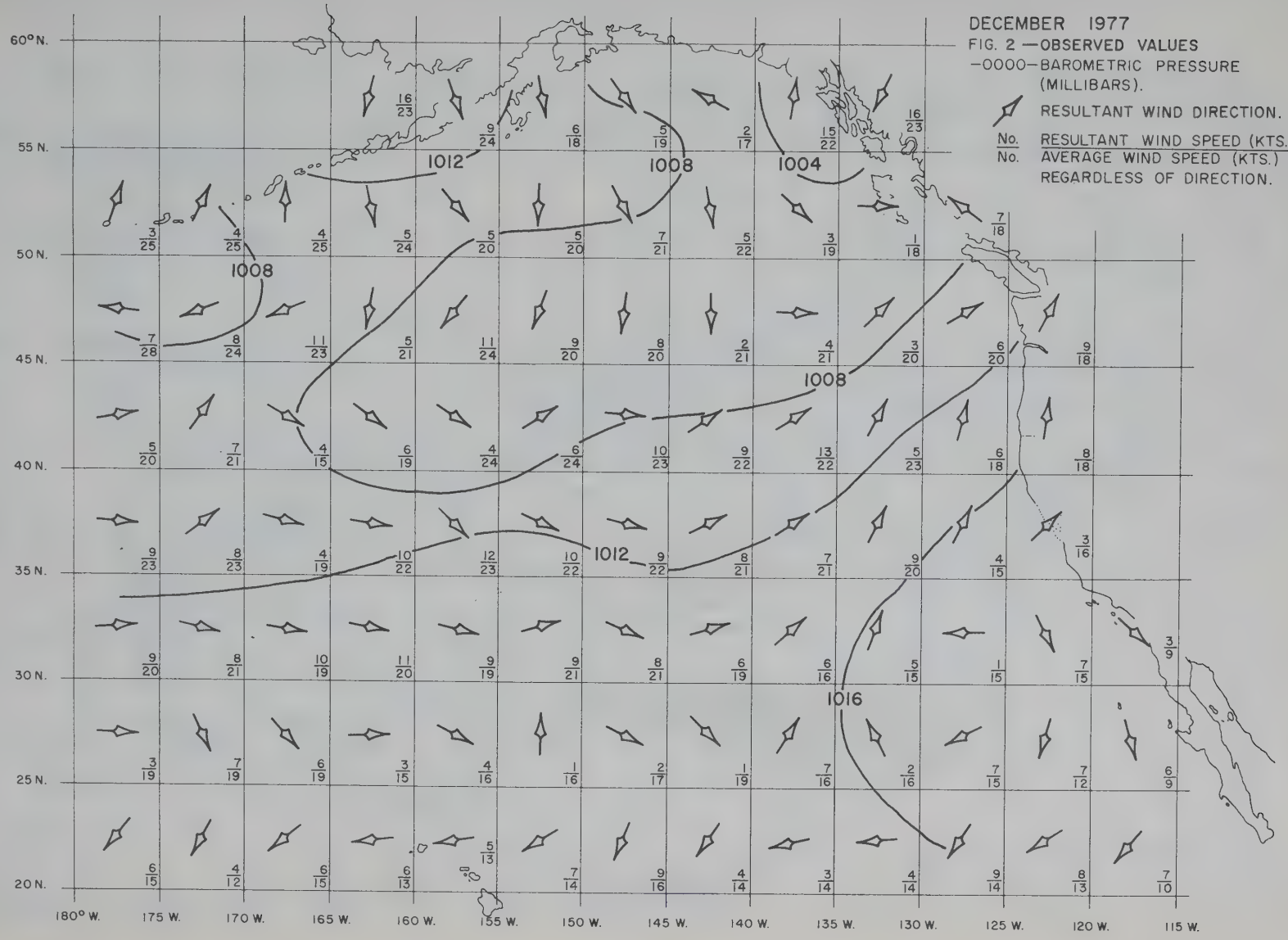
In the northern hemisphere the largest seasonal decrease in SST's of 1 to 2°C normally takes place in the California Current which moves southward along the west coast of Baja California. Elsewhere south of 25°N SST's usually decrease less than 1°C. Along the equator east of 120°W and in the Peru Current from 30°S to the Galápagos Islands, SST's normally increase 1 to 2°C during December. Because of seasonal warming in the southern hemisphere along the equator, the equatorial ocean front between Ecuador and the Galápagos Islands normally has a weaker north-south temperature gradient than during the preceeding 3 months.

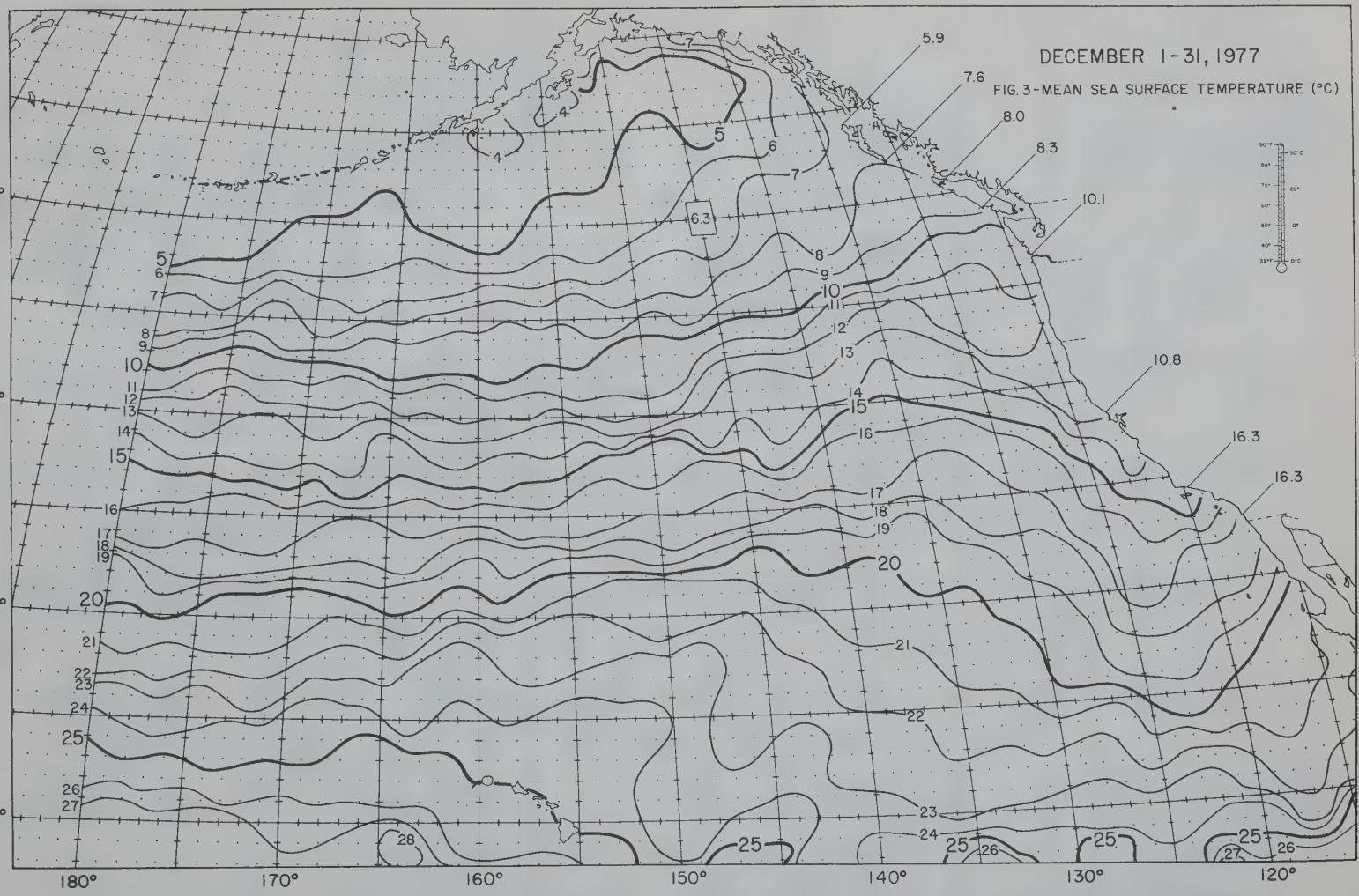
In December 1977 SST patterns along the west coast of Baja California remained nearly the same as in November 1977. The strong SST gradient along the southwest coast of Baja (Figure 8) was similar to that in November, and the positive SST departures from normal increased 1 to 2°C during December (Figure 9). There were two other significant areas of positive departures in the northern hemisphere. One area was south of 20°N and west of 140°W where a large area with positive departures greater than 1°C had SST's of 28 to 29°C. These warmer than normal SST's occurred where the subtropical high pressure system (Figure 2) was weaker than normal and consequently, the northeast trade winds were also weak. In this area, ocean mixing was probably less than normal. SST's were above normal also between 110°W and 125°W from 15°N to 20°N where weak northerly winds were associated with a very weak subtropical high pressure center located near 30°N, 127°W. Much of the remainder of the eastern tropical Pacific had SST's slightly above normal. Two exceptions occurred near the Gulf of Tehuantepec (south coast of Mexico along 96°W) and off the west coast of Costa Rica. In these areas, surface wind mixing and upwelling of subsurface water caused SST departures more than 1°C below normal.

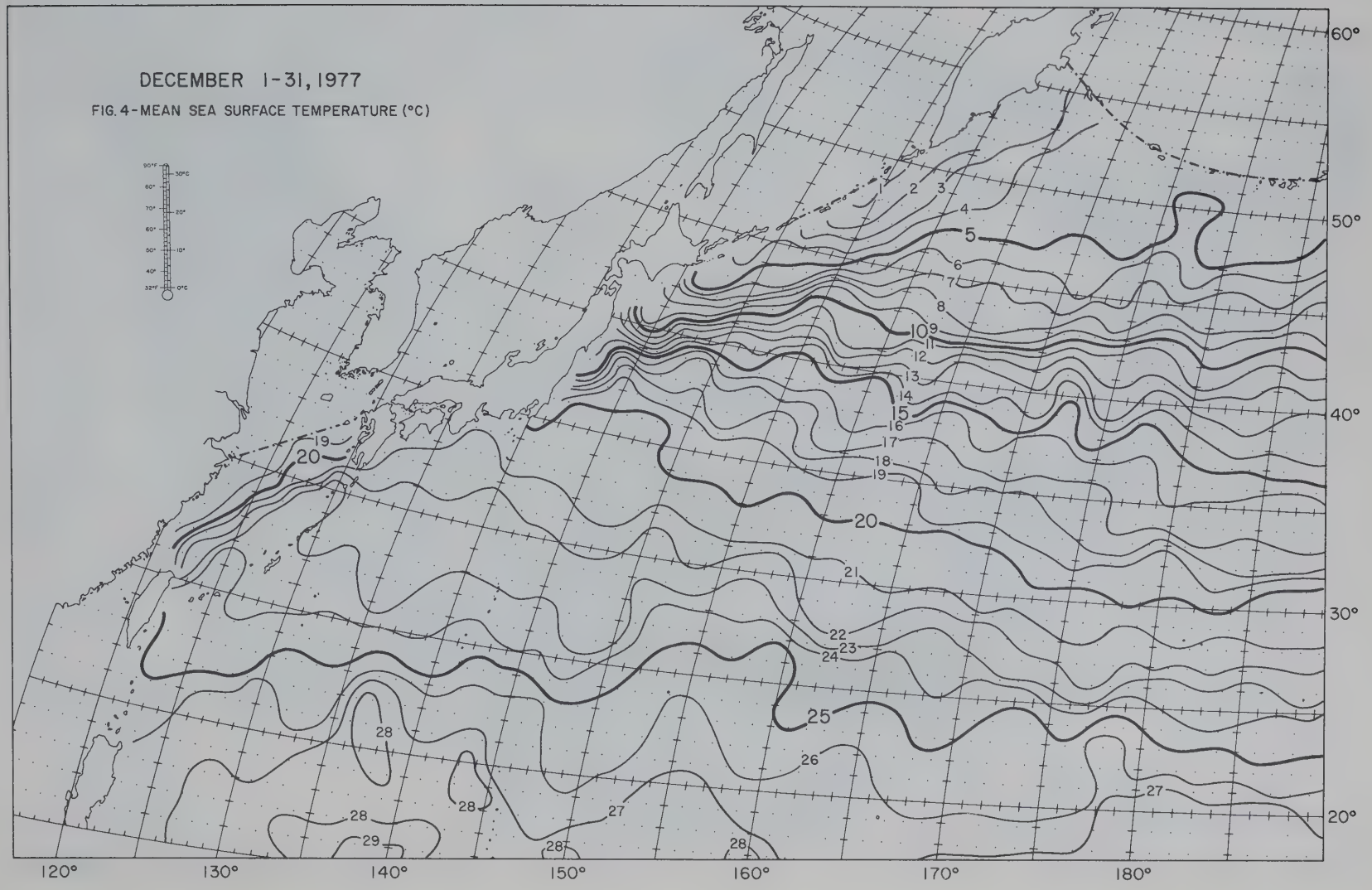
Along the equator east of 140°W, SST's were below normal over a larger region than in November, indicating that equatorial upwelling of subsurface water was progressing at a normal rate. To the west of 140°W SST's along the equator remained slightly above normal, partly because of clearer skies and weaker surface winds than normal on both sides of the equator. In the southern hemisphere, SST's in the Peru Current along the coast of Ecuador and Peru appeared to be warming at rates slightly less than normal (Figure 9).

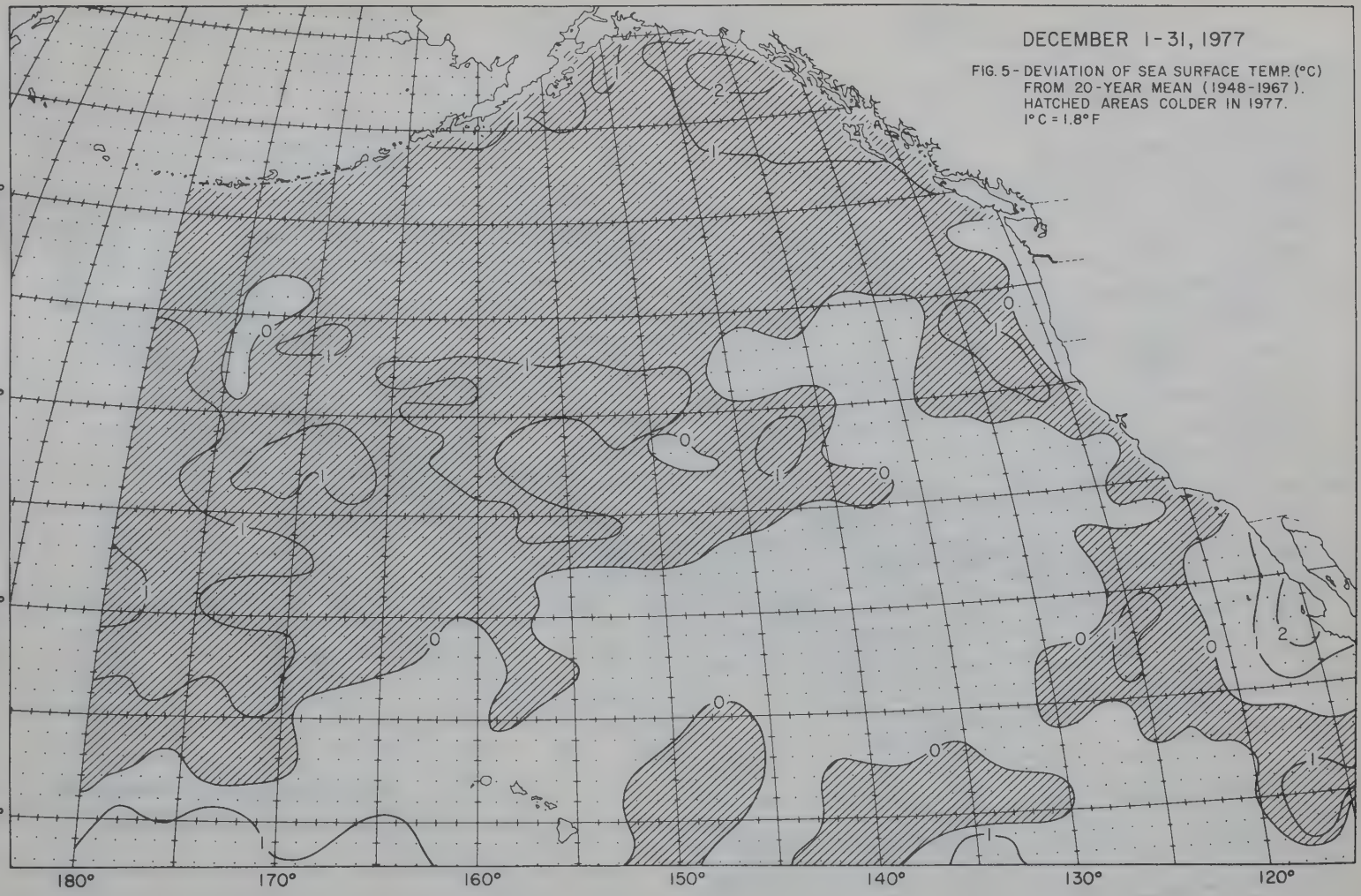
Because the southern high pressure center was located near its normal position (30°S, 90°W) with about normal pressures and southeast trade winds, it seems probable that El Niño (warm water) conditions will not return to the Peru Current this year. There has been a tendency over the past two months for a diminution of the areas with positive SST departures greater than 1°C in the southern hemisphere. Several small positive departures appeared in the December SST's in Figure 9, but there has been a gradual return toward normal from the equator to 20°S due, in part, to a re-establishment of the subtropical high pressure system and a general increase in surface winds over the tropical south Pacific. From August through the first half of November the high pressure system was weaker than normal.

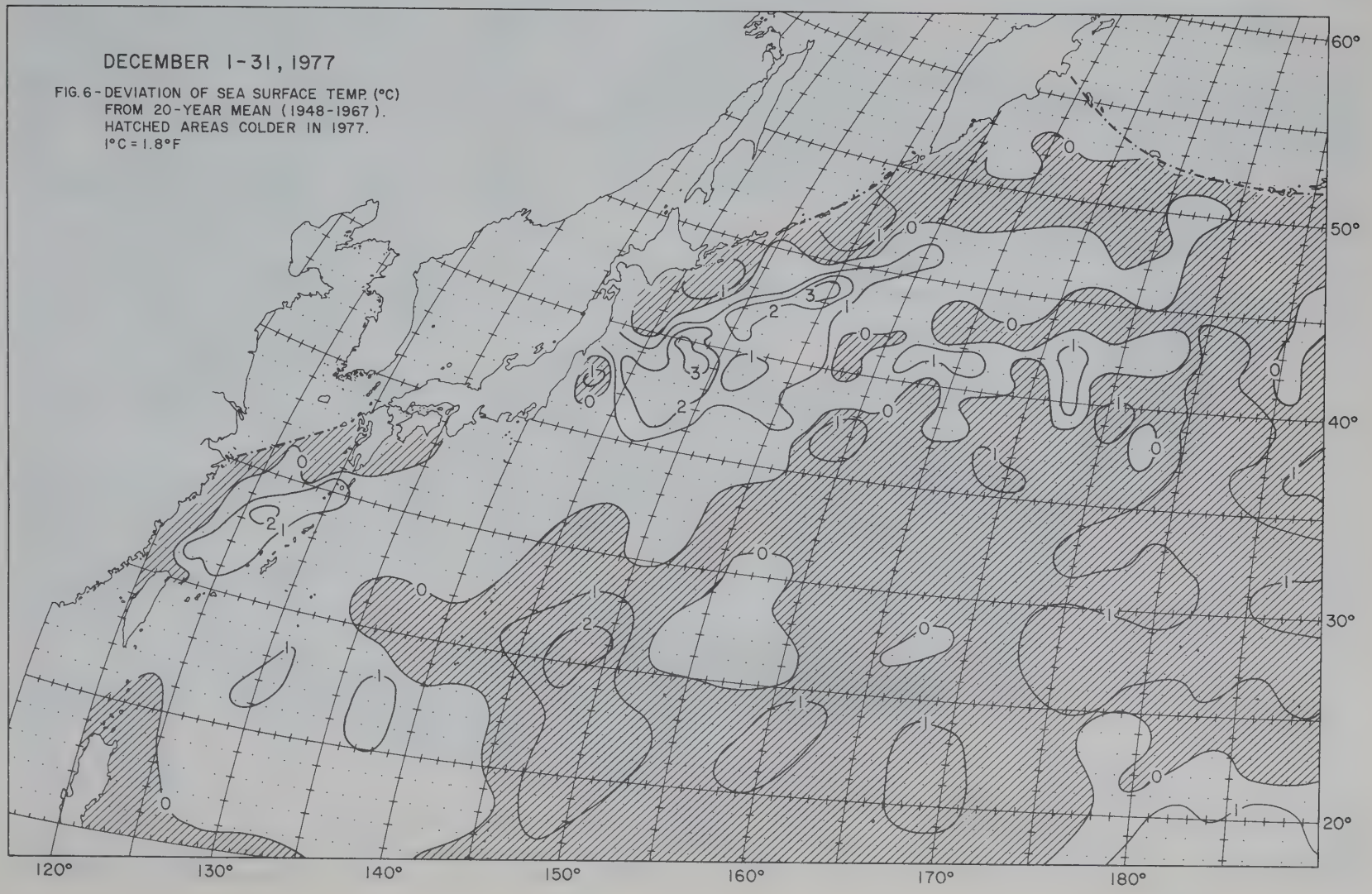

DECEMBER 1961 – 1977
FIG. 1 — OBSERVED MEAN VALUES
–0000– BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

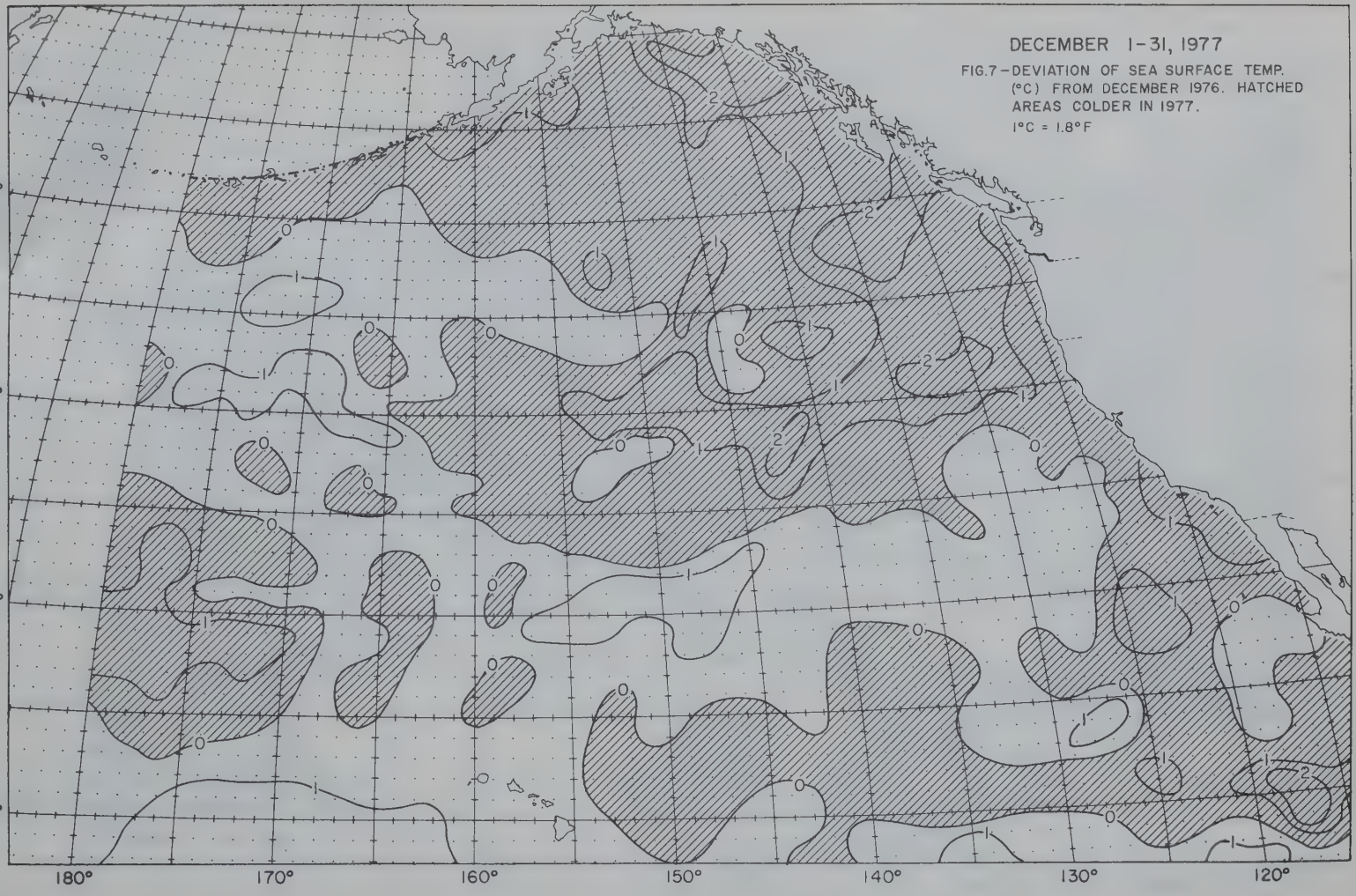

DECEMBER 1977
FIG. 2 —OBSERVED VALUES
—0000—BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1012
1008
1004
1008
1008
1012
1016
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

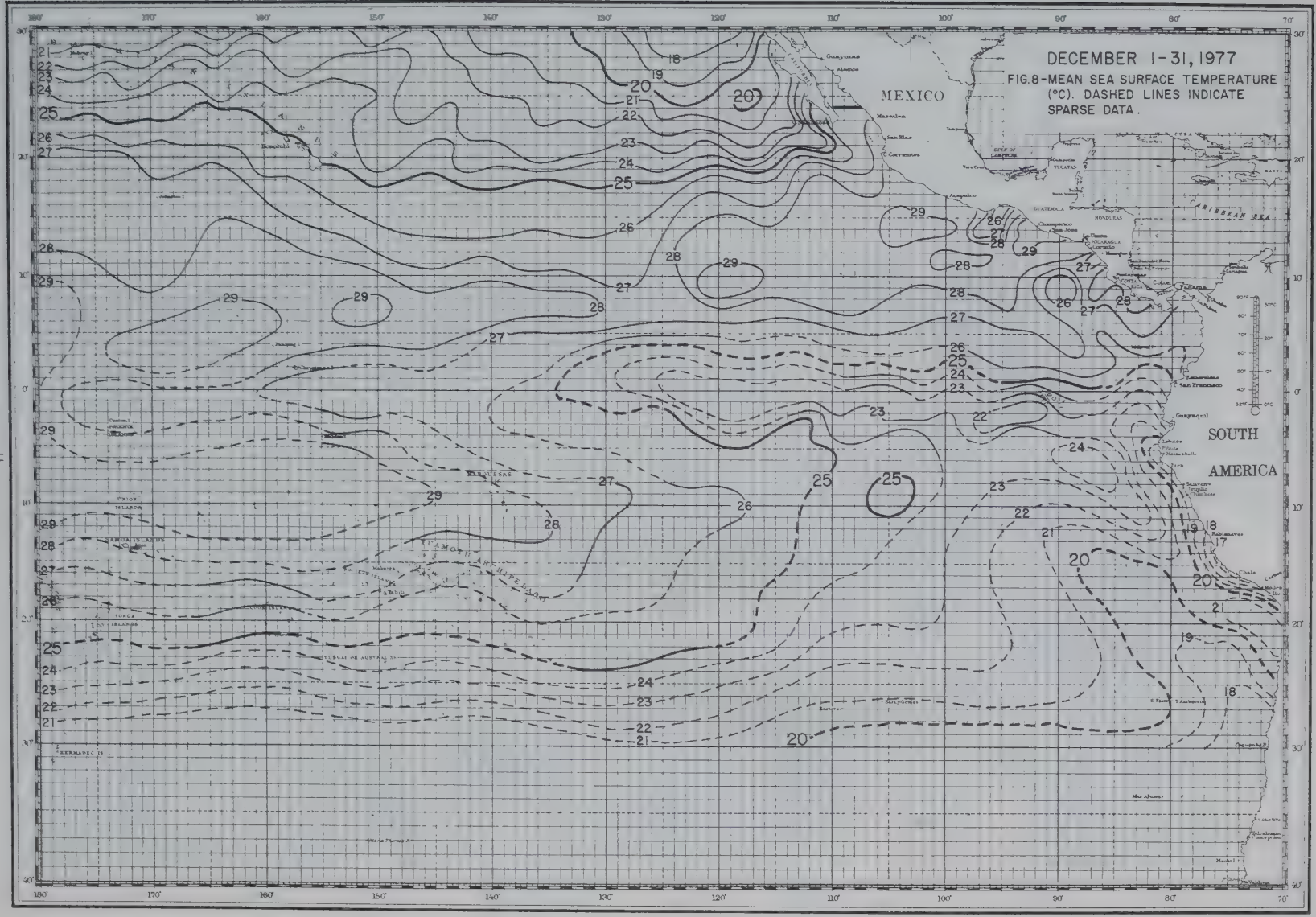

DECEMBER 1-31, 1977
FIG. 3-MEAN SEA SURFACE TEMPERATURE (°C)
5.9
7.6
8.0
8.3
10.1
10.8
16.3
16.3
6.3
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1977
FIG. 4-MEAN SEA SURFACE TEMPERATURE (°C)
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


DECEMBER 1-31, 1977
FIG. 5 - DEVIATION OF SEA SURFACE TEMP. (°C) FROM 20-YEAR MEAN (1948-1967). HATCHED AREAS COLDER IN 1977.
1°C = 1.8°F
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1977
FIG. 6 - DEVIATION OF SEA SURFACE TEMP. (°C) FROM 20-YEAR MEAN (1948-1967). HATCHED AREAS COLDER IN 1977. 1°C = 1.8°F
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


DECEMBER 1-31, 1977
FIG.7 – DEVIATION OF SEA SURFACE TEMP. (°C) FROM DECEMBER 1976. HATCHED AREAS COLDER IN 1977.
1°C = 1.8°F
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1977
FIG.8-MEAN SEA SURFACE TEMPERATURE (°C). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
VENEZUELA
TRUK ISLANDS
SAMOA ISLANDS
TONGA ISLANDS
KERMADEC IS
EQUATOR

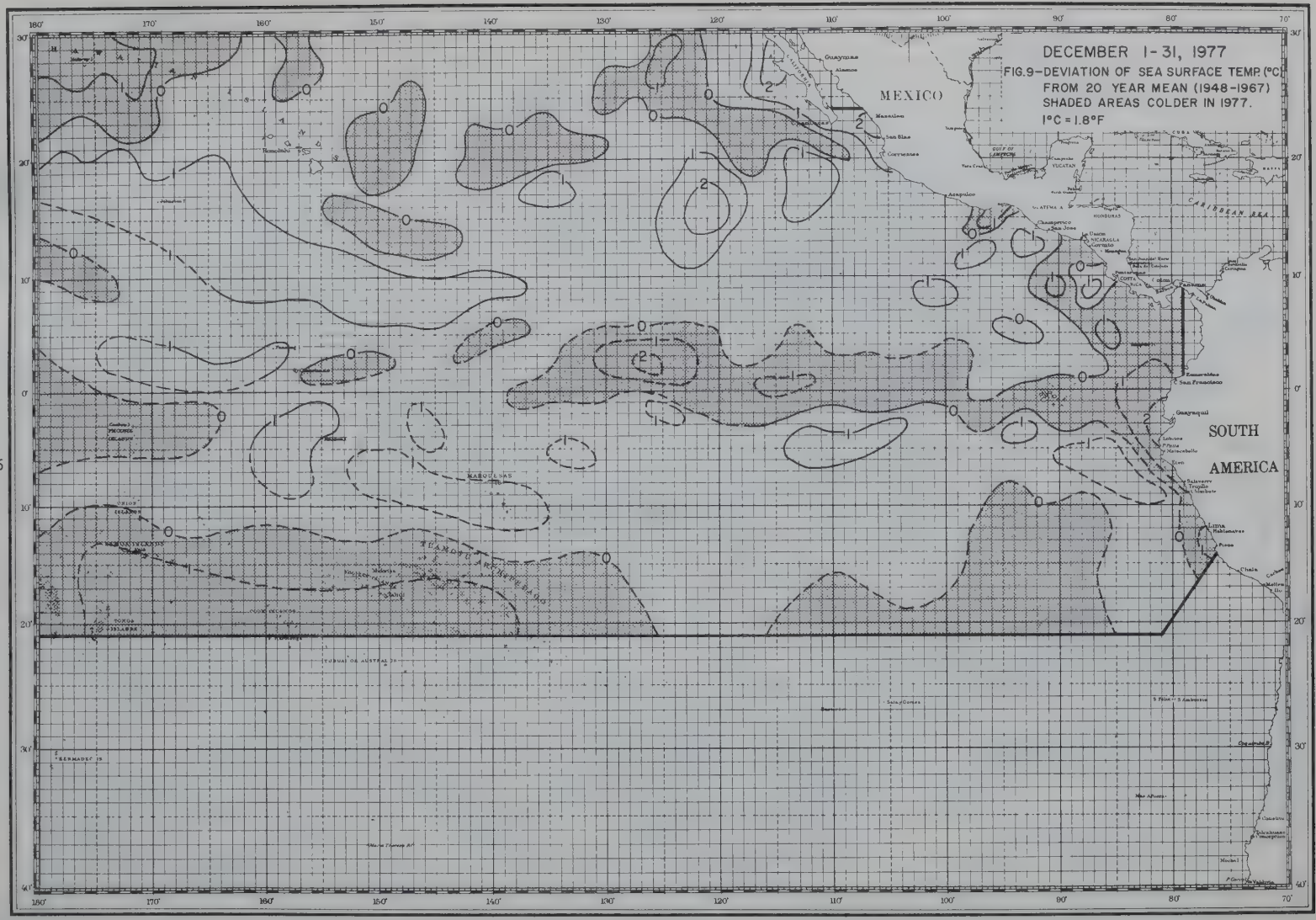
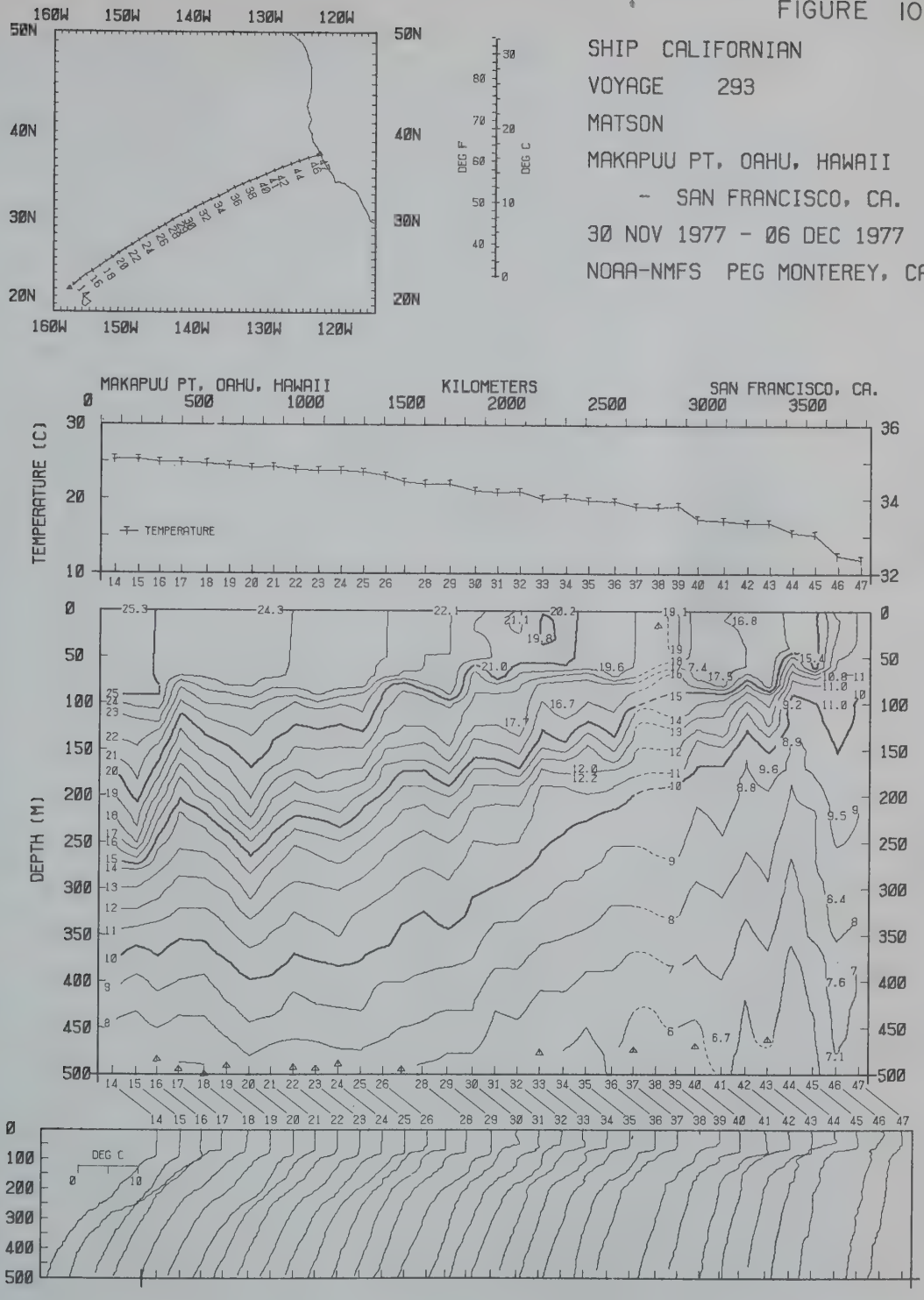

DECEMBER 1-31, 1977
FIG.9-DEVIATION OF SEA SURFACE TEMP.(°C) FROM 20 YEAR MEAN (1948-1967) SHADED AREAS COLDER IN 1977.
1°C = 1.8°F
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
CUBA
YUCATAN
GUATEMALA
Guaymas
Mazatlan
San Blas
Corrientes
Acapulco
Champerico
San Jose
Corinto
Puntarenas
Panama
Guayaquil
Salaverry
Trujillo
Chimbote
Lima
Callao
Pisco
Chala
Matarani
Iquique
Arica
Valparaiso
Talcahuano
Concepcion
Coquimbo
Juan Fernandez Is.
Easter Is.
Galapagos Is.
Marquesas Is.
Tuamotu Archipelago
Tubuai Is.
Austral Is.
Society Is.
Cook Islands
Tonga Is.
Samoa Is.
Fiji Is.
Bermuda Is.
Hawaiian Is.
Honolulu
Midway Is.
Wake I.
Marshall Is.
Gilbert Is.
Phoenix Islands
Line Islands
Tokelau Is.
Tuvalu Is.
Ellice Is.
Solomon Is.
New Hebrides
New Caledonia
Norfolk I.
Kermadec Is.
Auckland Is.
Macquarie I.
Mar Argentino
Mar Chileno
Mar Peruano
Golfo de Panama
Golfo de Guayaquil
Golfo de Fonseca
Golfo de Tehuantepec
Golfo de California
Bahia de Acapulco
Bahia de Salinas
Bahia de Sechura
Bahia de Independencia
Islas Malvinas
Islas Galapagos
Islas Revillagigedo
Islas Tres Marias
Islas Marias
Islas de la Bahia
Islas Roatan
Islas Cocos
Islas Juan Fernandez
Islas Desventuradas
Islas Sala y Gomez
Islas Ducie
Islas Oeno
Islas Pitcairn
Islas Henderson
Islas Gambier
Islas Tuamotu
Islas Tubuai
Islas Austral
Islas Cook
Islas Tonga
Islas Samoa
Islas Fiji
Islas Bermudas
Islas Hawaianas
Islas Midway
Islas Wake
Islas Marshall
Islas Gilbert
Islas Phoenix
Islas Line
Islas Tokelau
Islas Tuvalu
Islas Ellice
Islas Solomon
Islas New Hebrides
Islas New Caledonia
Islas Norfolk
Islas Kermadec
Islas Auckland
Islas Macquarie
Mar Argentino
Mar Chileno
Mar Peruano
Golfo de Panama
Golfo de Guayaquil
Golfo de Fonseca
Golfo de Tehuantepec
Golfo de California
Bahia de Acapulco
Bahia de Salinas
Bahia de Sechura
Bahia de Independencia
Islas Malvinas
Islas Galapagos
Islas Revillagigedo
Islas Tres Marias
Islas Marias
Islas de la Bahia
Islas Roatan
Islas Cocos
Islas Juan Fernandez
Islas Desventuradas
Islas Sala y Gomez
Islas Ducie
Islas Oeno
Islas Pitcairn
Islas Henderson
Islas Gambier
Islas Tuamotu
Islas Tubuai
Islas Austral
Islas Cook
Islas Tonga
Islas Samoa
Islas Fiji
Islas Bermudas
Islas Hawaianas
Islas Midway
Islas Wake
Islas Marshall
Islas Gilbert
Islas Phoenix
Islas Line
Islas Tokelau
Islas Tuvalu
Islas Ellice
Islas Solomon
Islas New Hebrides
Islas New Caledonia
Islas Norfolk
Islas Kermadec
Islas Auckland
Islas Macquarie

FIGURE 10

SHIP CALIFORNIAN
VOYAGE 293
MATSON
MAKAPUU PT. OAHU, HAWAII
- SAN FRANCISCO, CA.
30 NOV 1977 - 06 DEC 1977
NOAA-NMFS PEG MONTEREY, CA.



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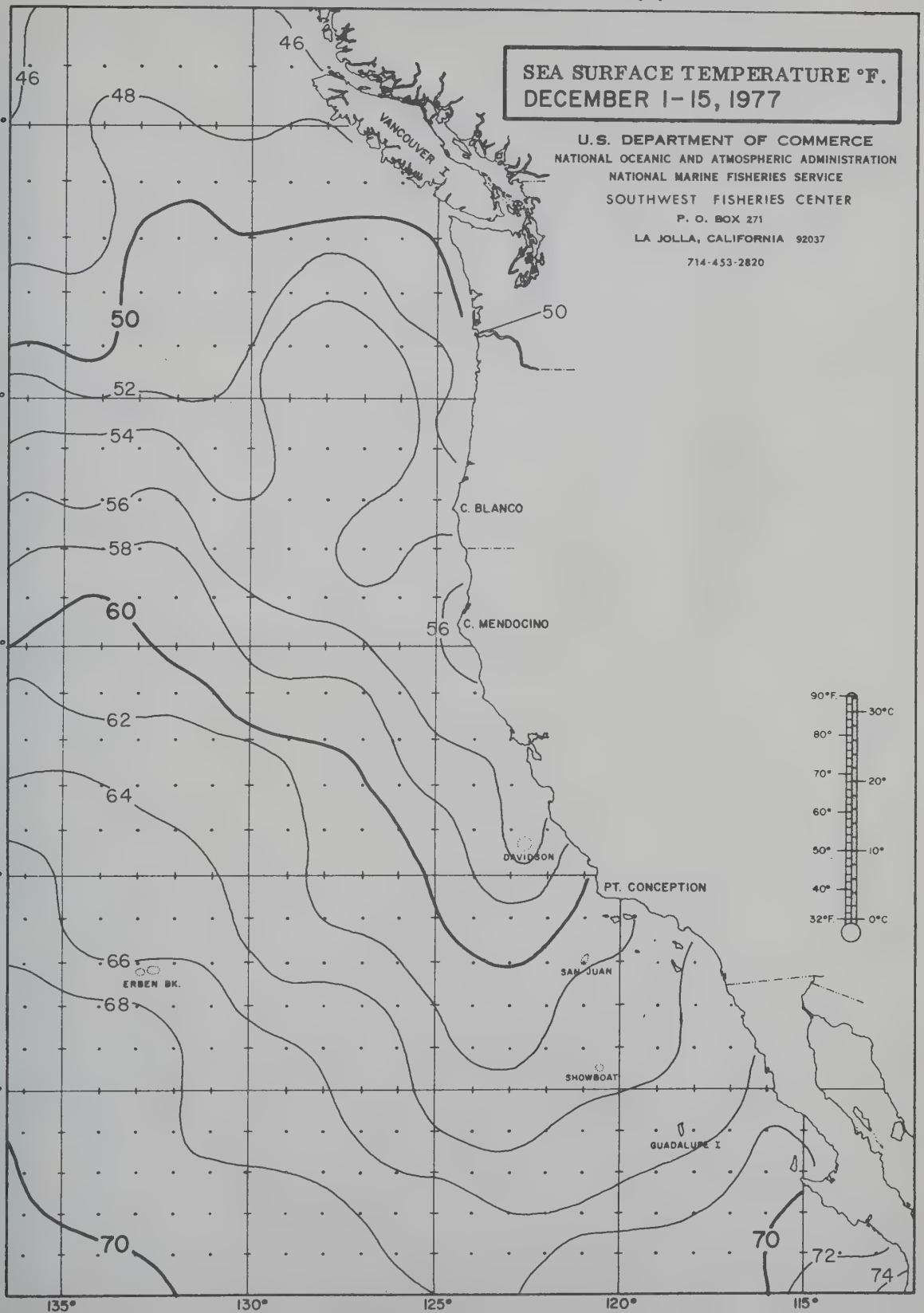

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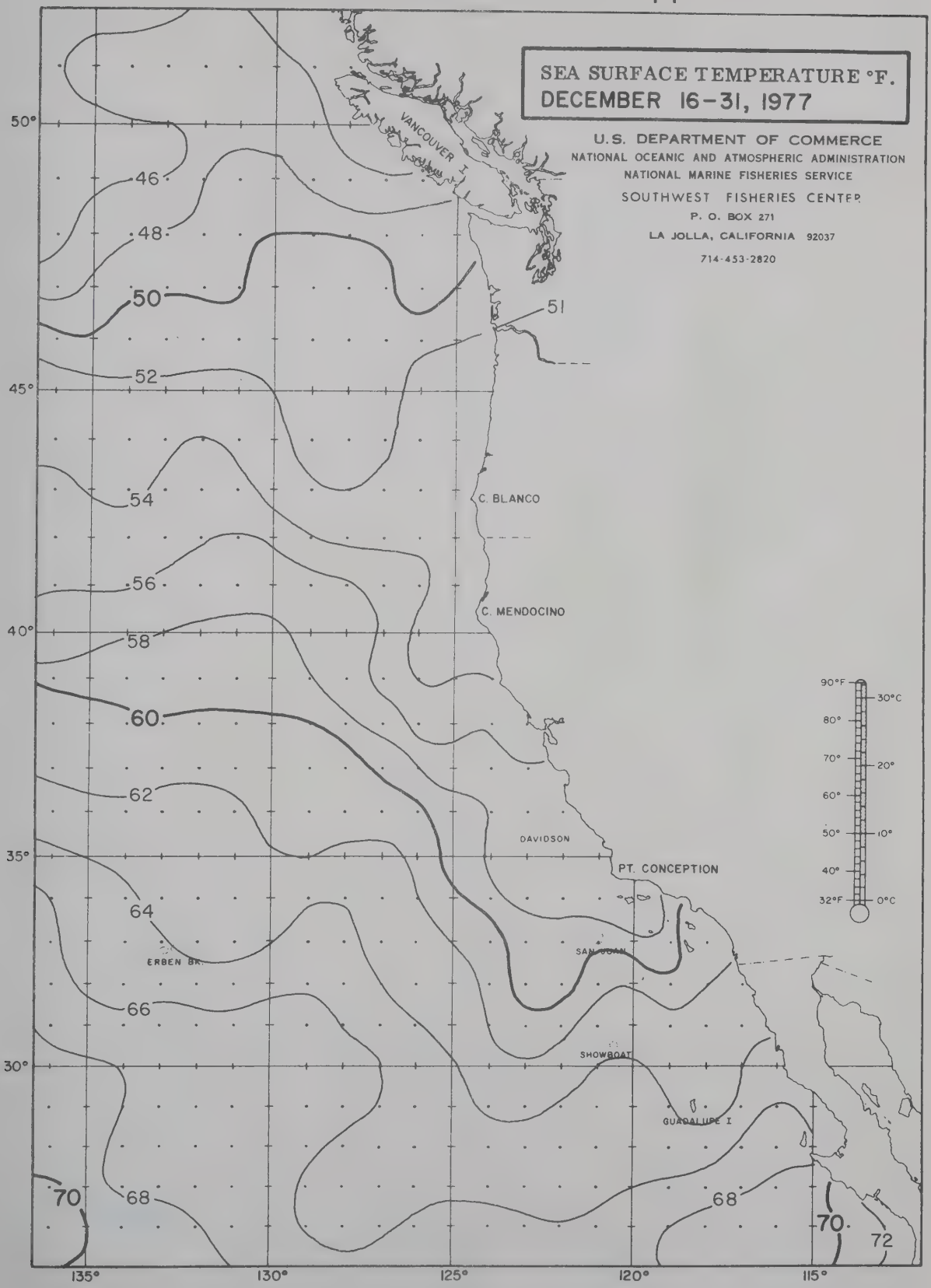

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